RENAL LITHIASIS DECISION SUPPORT SYSTEM

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Nephrolithiasis is a common disorder. Five percent to fifteen percent of the population will develop kidney stones during their lifetimes. A number of specific biochemical and physiological disturbances have the potential to create an environment conducive to renal stone formation. The **Renal Lithiasis Decision Support System (Renal DSS)** was developed to help physicians on the diagnosis of metabolic disturbances that affect lithiasic patients. The system consists of a knowledge base on renal lithiasis, with knowledge extracted from both experts and literature and a decision support module, integrated with the knowledge base; This system was validated in the domain of renal diseases.

Experts' knowledge were organized as 22 different metabolic diagnoses, according to criteria based on both literature and the experience. Knowledge was elicited and represented as decision trees, covering the following diagnoses: Idiopathic Hypercalciuria (including Renal, Absorptive, Reabsorptive Unclassified and Marginal subtypes), Hypocitraturia, Hypophosphatemia, Primary hyperparathyroidism, Urinary Tract Infection, Hyperoxaluria, Hypercalcemia, Uric Acid Hyperexcretion, Uric Acid Hyperexcretion Marginal, Distal Renal Tubular Acidosis, Cystinuria and No Metabolic Disorder. The inference process was based on laboratorial data extracted from the patients' database.

The system wed up to five associated diagnosis for each patient. Validation was performed with an experts' panel (Panel), comprehending two experts on nephrolithiasis. This experts' panel was the *gold standard* for validation purposes.

Two other experts (EX1 and EX2) were also used in the validation process. One hundred patients' data entry sheets were randomly chosen from the Renal Lithiasis database of the Federal University of São Paulo. The validation process evaluates the system's performance against the gold standard and against the other two experts' opinion. *Kappa* and z statistic tests were used in order to establish the agreement between the panel and the experts. The standard error (SE) was also calculated. Only diseases with a frequency of occurrence above 5% were considered in the validation process.

The maximum reference value for ratio *Kappa*/SE was established as 10. For the metabolic diseases, the overall agreement percentage between the panel and the system was over 96%, (*Kappa* close to 1 and z over 9). When comparing the system performance, against the other two experts EX1 and EX2 the agreement percentage was also above 98%, with *Kappa* close to 1 and z over 9.

These results suggest that the system may represent an important tool to support physicians on the diagnosis of metabolic disturbances of lithiasic patients.

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